

Cominman Company

Company Background

The Communications & Information Management (Cominman) Company has been in business for 20 years, providing, on a national scale, communications and information management services. The company's warehouse, part of the Property Management Division, provides storage and excess services for company property in the custody of 25 divisions. The warehouse department has a staff of ten personnel: a warehouse supervisor, four property specialists, one property clerk, three drivers, and one data entry clerk. The warehouse makes approximately 50 pickups per week at company locations that include remote areas.

Process Description

To request services from the warehouse, a division customer telephones the warehouse property clerk requesting a pick-up of property for storage or excess. The customer provides the clerk with the property identification number or serial number for each piece of property to be picked up and brought to the warehouse. There are typically one to twenty pieces of property per pick-up. If a pick-up date is not requested by the customer, a date will be provided to the customer by the property clerk. The property clerk completes a property transfer form, which reflects the date of the call, customer's name, division, location, property identification number and date scheduled for pick-up. A goal of the warehouse is not to exceed three days from the date of the call to the time of the pick-up, unless a special date has been requested by the customer. The warehouse receives approximately ten calls per week for pick-ups on special dates. On the scheduled pick-up day, the assigned driver takes the transfer form to the designated location. The driver is responsible for ensuring each piece of property matches the property identification numbers or serial numbers listed on the transfer form. After the truck is loaded, the driver obtains the customer's signature on the transfer form. The driver also signs the form and provides the customer with a copy acknowledging receipt.

The driver returns to the warehouse, where a property specialist annotates the date on the transfer form, unloads the truck, and provides the data entry clerk with the signed copies of the form. The data entry clerk enters the information from the transfer form into the automated accountable property system and the transfer forms are then filed. The data entered are intended to transfer accountability from the division customer to the warehouse.

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At the end of the month, division customers receive a computer-generated property list indicating the accountable property in their location for which they are responsible. The customer reviews this report for accuracy. If the customer records do not agree with this listing, the customer calls the warehouse supervisor who logs the complaint with the following information: date of the call, division name, property location, date of the property list, and discrepancies. The supervisor assigns a property specialist to resolve these discrepancies.

Issue

The warehouse supervisor had recently attended a Quality Leadership Seminar during which time a workshop was conducted on Performance Measurements. During a review of the telephone complaint logbook, a supervisor realized that customer complaints were beginning to increase. The supervisor felt that developing Performance Measurements for the warehouse process would be beneficial. Why?

- To ensure that customer requirements are being met. How do we know that we are providing the service that our customers require?
- To ensure an understanding of the process by all warehouse employees.
- To ensure we are meeting value-added objectives or that we are being effective and efficient.
- To ensure decisions are based on fact, not on emotion.
- To show where improvements need to be made. Where can we do better? How can we improve?

The Quality Leadership Seminar stressed the value of a team-based approach when solving problems or establishing performance measures. The supervisor, therefore, decided to involve her entire staff in developing performance measurements for their process. The supervisor was the team leader; a trained facilitator was requested to assist them; and the team elected the property clerk as the secretary. They were ready to start.

The group is responsible for many processes, such as delivering property, conducting inventory, etc. For purposes of simplicity, this case study only addresses the process of picking up property or storage.

Step 1: Identify Process

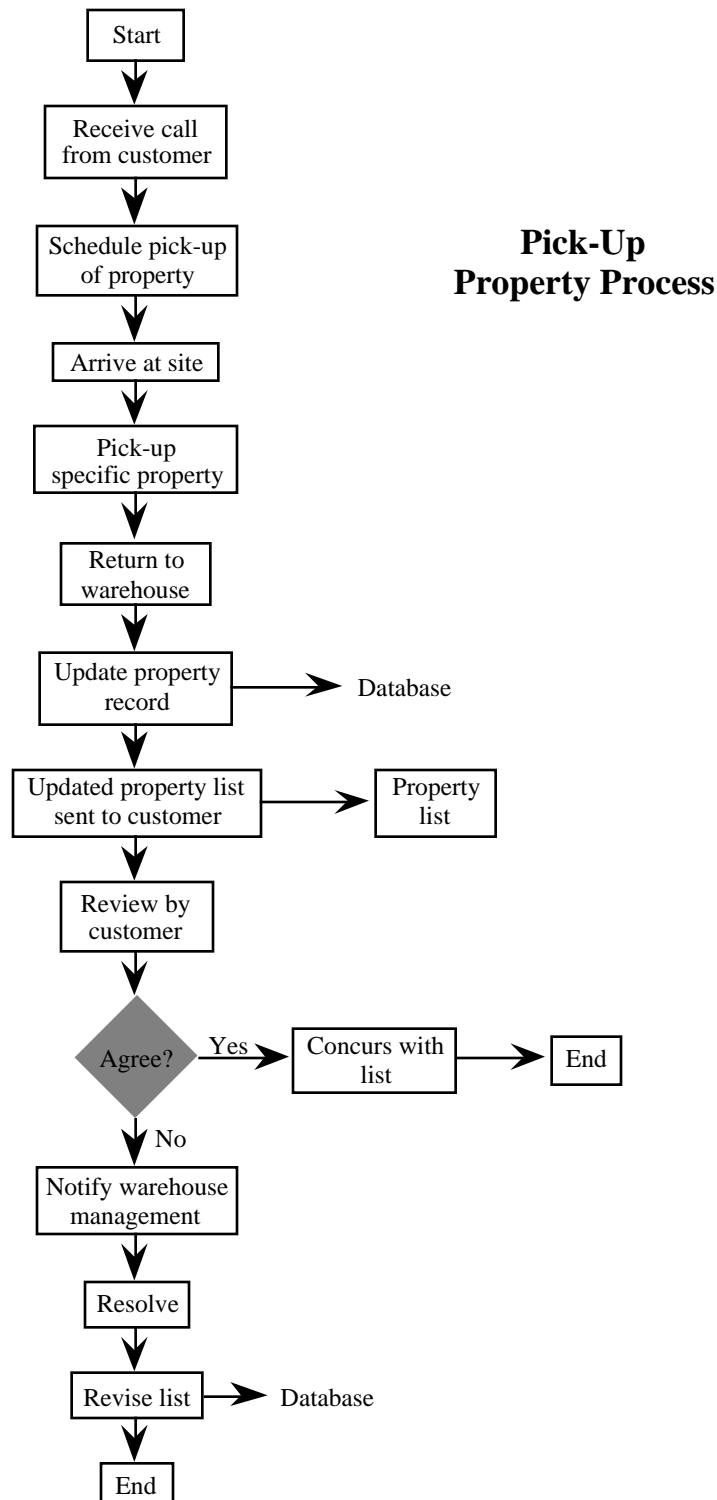
The supervisor thought, “Where do we begin? What is the very first thing we have to do?”

Well first, she thought, we need to define our current process so all my team members can share a common understanding of what we do. The tools? Brainstorming and Flow Diagramming.

- Brainstorming is a group technique for generating new, useful ideas. It uses a few simple rules for discussion that increase the chances for originality and innovation.
- Flow diagramming is a method of graphically describing the activities and sequence that we perform to produce some output in a process. Before you try to control a process, you must understand it. Flow diagramming is basic to understanding our work and the way we function as a whole.

So the supervisor gathered the department together, and they began to document all the steps in their work process. Post-it sheets were all over the wall! What started their work? A telephone call from a customer. What ended their process? An accurate property list. They wrote down all the related activities between these two boundaries (input/output) in the order in which they occurred. The department realized that the flow diagramming session was certainly a time of “discovery.” Contrary to what they thought, they did not proceed quickly and they did not proceed methodically through their process from beginning to end, capturing every detail the first time through. A lot of discussion took place. Finally, the department reviewed the completed diagram to see if they had missed any activities or decision points and verified the accuracy of the flow diagram. Is this the actual process? Yes, they all agreed. A lot of time was spent on this effort. However, the supervisor was very pleased. “We have an invaluable tool; a map of our process,” she stated (Figure B-1). “Now we can start thinking about performance measurements.”

Figure B-1
Step 1: Identify Process
Department's process for picking up property



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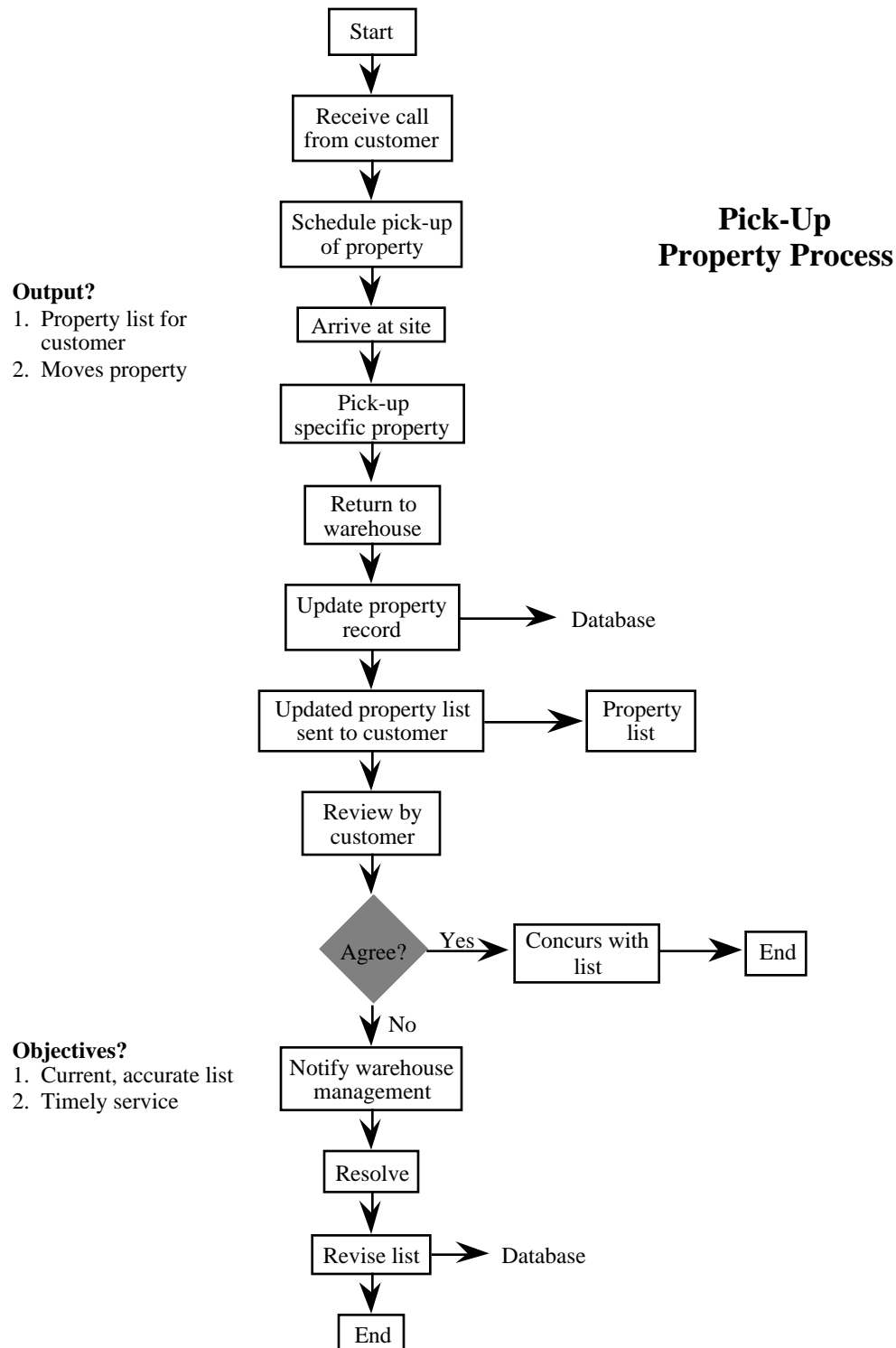
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Or can we? The supervisor thought for a moment. She learned in her workshop that performance measurement is better thought of as an overall management system, involving prevention and detection aimed at achieving conformance of the work product or service to our customer's requirements. Performance measurement is primarily managing outcome, and one of its main purposes is to reduce or eliminate overall variation in the work product or process. The goal is to arrive at sound decisions about actions affecting the product or process and its output.

So she asked her department, "What is our product? What is our output?" The department came up with two outputs: (1) a property list for their customer, and (2) removal and storage of company property.

She then told her department that measurements should focus on their customer's needs. They should measure only what is important: Things that impact customer satisfaction, goals given by management, and their own internal objectives. Keeping the customer in mind, she asked her department, "What is the objective of our two outputs?" They responded immediately. Their objectives were (1) a current, accurate property list for our customers; and (2) timely pick up and removal of property. (Refer to flow diagram Figure B-2).

Figure B-2
Step 1: Identify Process - Continued
Department's process for picking up property



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Step 2: Identify Critical Activity to be Measured

The next step is determining how objectives will be met.

One of the topics discussed in the Performance Measurement workshop was involving employees in the design and implementation of the measurement system. This gives them a sense of ownership and improves the quality of the measurement system.

The supervisor called her department together again. “We are now ready to identify specific critical activities to set up our control points. Controlling, or keeping things on course, is not something we do in the abstract. Control is applied to a specific critical activity.”

She continued to instruct her department that they should examine each activity in the process and identify those that significantly impact total process efficiency and effectiveness. Then they should establish measurements for these critical activities.”

Ask the following: Does it relate, directly or indirectly, to the ultimate goal of customer satisfaction? Every critical activity should.

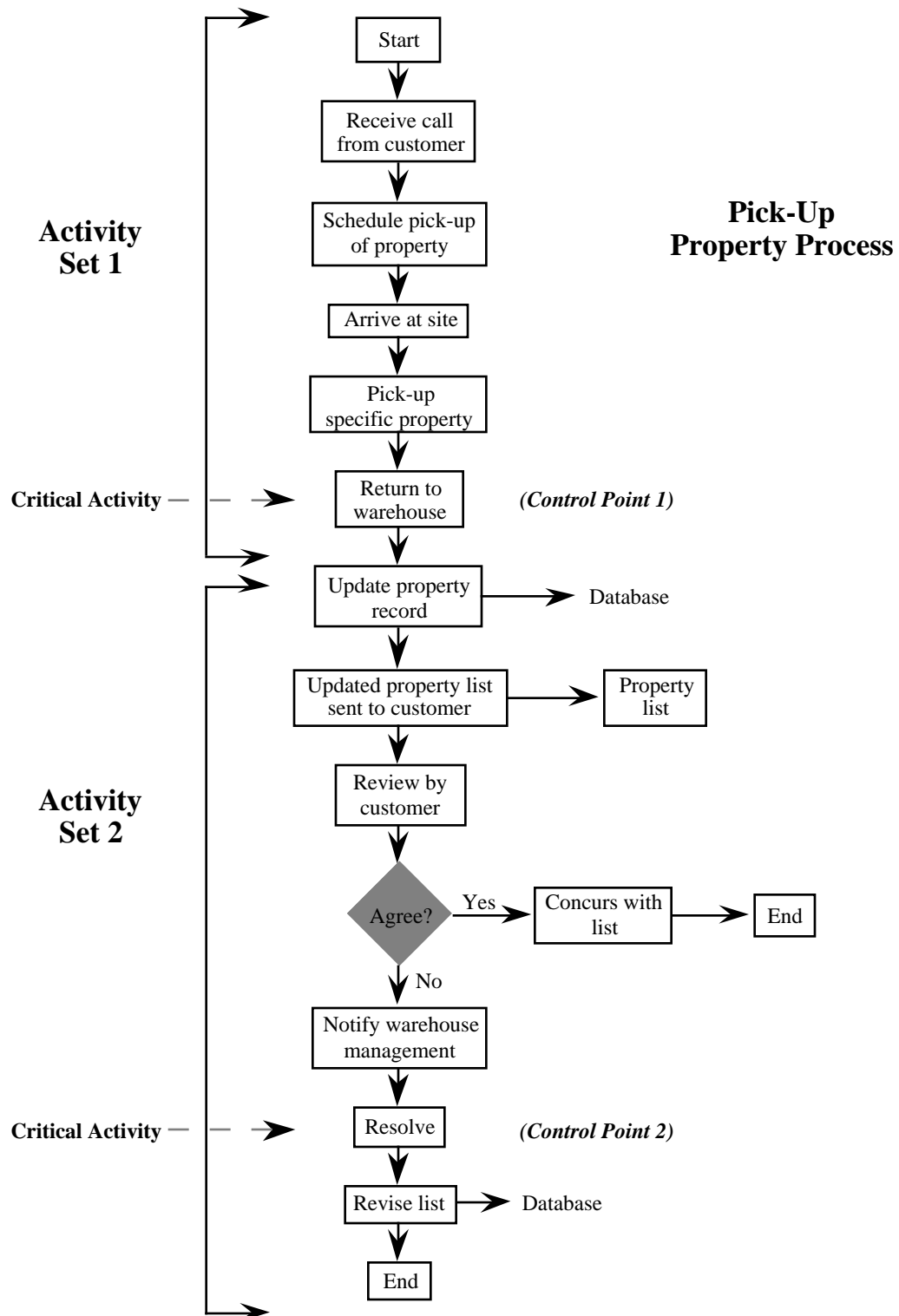
The department began to brainstorm. “Keep focused,” the supervisor reminded. “Keep looking at our objectives. How can we accomplish these?” The supervisor stated that as they approached the data collecting step, the key issue was not “how do we collect data?” Rather, the key issue is “How do we generate useful information?” You must learn to ask the right question(s), the supervisor cautioned. “It is crucial to be able to state precisely what it is you want to know about the activity you are going to measure. Without this knowledge, there is no basis for making measurements.

The department thought about this and after some more discussion felt they needed the answers to two questions:

1. How do we know that we are providing the service that our customers require?
2. Where can we do better or improve?

All parties finally agreed upon two sets of critical activities that needed to be watched closely and acted on if performance is less than the desired goal. The reason these were considered critical is they are the sets of activities that produce our outputs (refer back to Figure B-2). Control point 1 is when the driver returns to the warehouse after pick-up. Control point 2 is when a discrepancy on the property report is resolved (Refer to Figure B-3).

Figure B-3
Step 2 - Identify Critical Activity to be Measured



Step 3: Establish Performance Goals or Standards

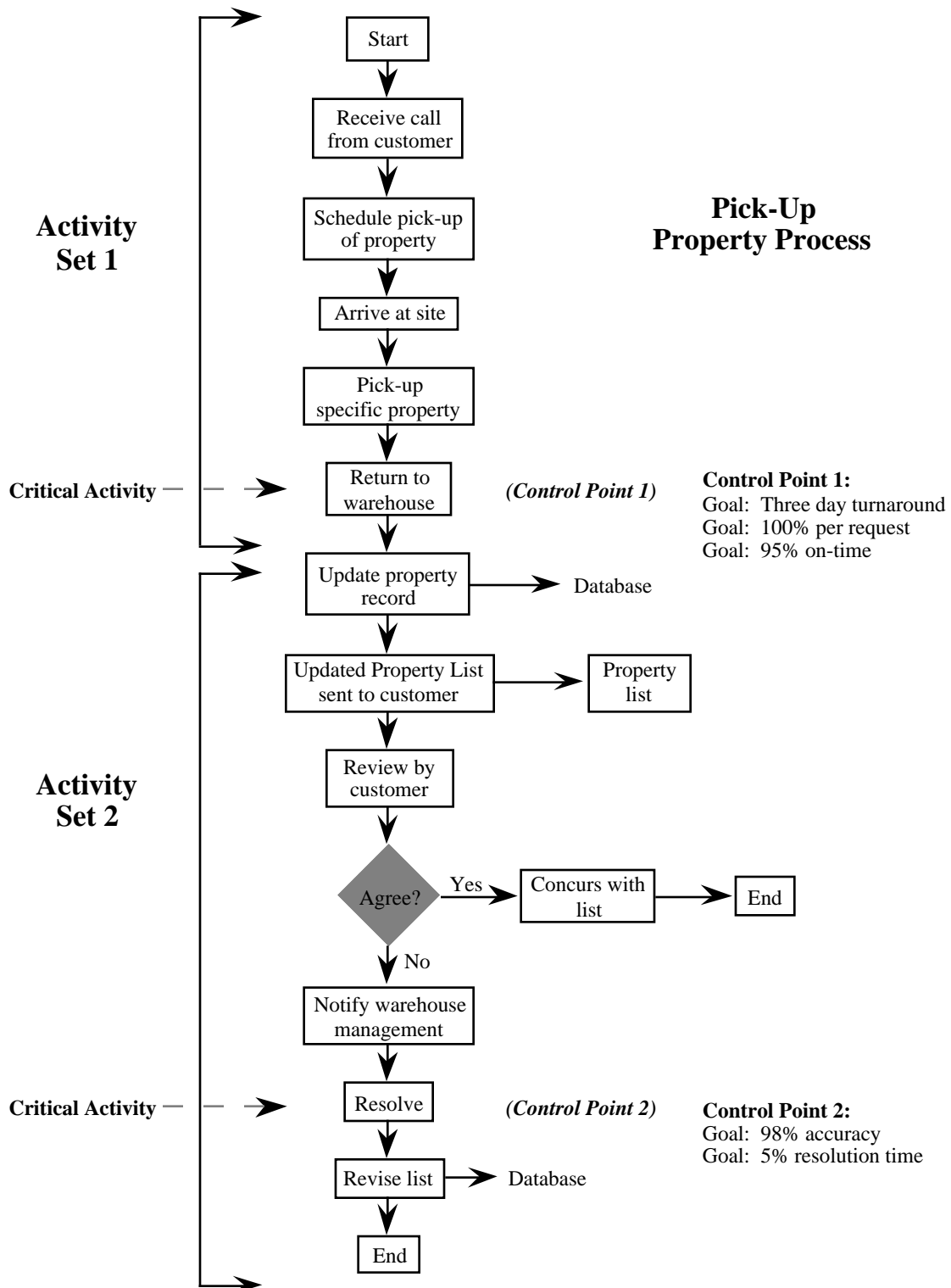
The supervisor was very pleased. “We are moving along quite nicely. Now we are ready to establish a performance goal or standard,” she stated. She continued and said that for each control point selected for measurement, it would be necessary to establish a performance goal or standard. She again referred back to her workshop notes. A goal or standard is:

an “aimed-at” target; an achievement toward which effort is expended. Without a goal or standard, there is no logical basis for making a decision or taking action. Knowledge of performance is not enough; you must have a basis for comparison before you can decide or act.

Because this is the first time the department has ever considered formalizing measurements, they would need to establish some sort of baseline to set goals. The basis for the initial goals chosen were the informal observations made by the department. The department planned to reevaluate the goals in six months.

The department looked at Critical Activity 1, Return to Warehouse. They reviewed their objectives and came up with three goals: (1) three-day turnaround; (2) scheduling pick-up per customer request; and (3) 95% on time pick-ups. For Critical Activity 2, Resolve Discrepancies, they did the same thing and came up with two goals: (1) 98% property list accuracy and (2) no more than 5% of their time-resolving discrepancies. The department was satisfied that these performance goals would produce the output and their corresponding objectives (Refer to Figure B-4). They were now ready to move on to the next major activity.

Figure B-4
Step 3: Establish Performance Goal(s) or Standards



Step 4: Establish Performance Measurement(s)

Again, the supervisor was satisfied with their progress. Now they needed to identify specific performance measures for the two critical activities they identified. The department decided to do some brainstorming to generate potential performance measures. This step took a considerable amount of time, and the team was clearly frustrated.

The supervisor reminded her department that good performance measures exist to aid in understanding how well a process or activity is working or how well a product or service is produced and delivered. “Remember,” she said, “what we measure should help us control and manage our work.” She also reminded them that in addition to identifying performance measures, they must also determine what raw data they will need to collect, find its location, determine what sensors will measure or record the raw data, and decide how often the data will be collected.

The team felt somewhat overwhelmed by what seemed like a difficult task. The supervisor quickly pointed out that for the first time, they would have measurable data that they could track to determine how well they were doing and identify areas for improvement.

The team frequently found themselves asking, “what is it that we really want to know about what we do.” Their supervisor reminded them that since they already had quantifiable goals, they could use these to help determine their performance measures.

Critical Activity 1:

Performance Measure A

One of the goals of the department had always been to perform all property pick-ups in three days or less. The team decided that measuring the number of days elapsed from call to pick-up for all routine requests would be a useful performance measure that could be compared directly to their goal. The raw data needed to construct their performance measure was simply the date of each call for pick-up services and the actual date of pick-up. The data could be retrieved from the Property Transfer form and collected weekly. If 50 regular pick-ups are performed in a week, the team would have 50 measures to plot. The team decided to plot this measure in the form of a histogram, which could be used to display the results of one week’s worth of data. In this way they could display how many deliveries took one day, two days, three days, and so on.

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Performance Measure B

The department had already determined that it was very important to make all specially scheduled pick-ups on time. They had already chosen a goal of 100% on-time pick-up for specially scheduled jobs, so they needed a performance measure that would track their results. The team reasoned that a simple performance measure would be the percent of on-time special pick-ups. Since a percent results from the ratio of two numbers, this measure can be shown more clearly as follows:

$$\frac{\text{Number on-time special pick-ups}}{\text{Number scheduled special pick-ups}} \times 100$$

Expressing this performance measure as a ratio gives an indication of what data are needed to actually construct it. In this case, the team would need the number of special pick-ups scheduled for each week and the number performed on time. The Property Transfer form records the scheduled pick-up date and the actual pick-up date.

Performance Measure C

Since the department had a goal that 95% of all pick-ups (without regard to type) would be performed on time, they needed a performance measure to make a comparison. This was rather straightforward, and the team settled on Percent On-Time Pick-Ups. As in the previous performance measure, this measure is the result of a ratio and can be written as:

$$\frac{\text{Number on-time pick-ups}}{\text{Total number of pick-ups}} \times 100$$

In order to make this calculation, the team had to determine what raw data were needed. To calculate the total number of pick-ups, the team noted that they needed to only count the total number of property transfer forms completed each week as this would tell them how many pick-ups were completed. For this performance measure, the number of on-time pick-ups includes both the regular and specially scheduled pick-ups that are performed each week. The teams would have to calculate how many regular pick-ups were on time and how many specially scheduled pick-ups were on time. Again, the property transfer forms record the type of transaction and all dates needed.

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Critical Activity 2

Performance Measure A

Another product of the department is the monthly property list, which consists of line items that specify property type, owner, and location. The team had already decided that this list should be at least 98% accurate, and now they needed a performance measure to go assess their work. In this case, the performance measure is the percent of accuracy of the monthly property list. Since this measure results from a ratio, it makes sense to write it out the way the calculation is actually performed. Percent accuracy is the percent done correctly error-free and is written as:

$$\frac{\text{Number of error-free line items}}{\text{Total number of line items}} \times 100$$

Written this way, it was obvious to the team what raw data they needed to make this calculation. First, they needed the total number of line items or entries from all of the property lists that they generate each month. This was available in the database and was easily extractable each month. Second, they needed the number of error-free entries for each month. To determine this number, they needed to check the complaint log to find the number of discrepancies that were their fault. The total number of entries minus the discrepancies are the number of error-free line items. Discrepancies that are due to customer error (such as misplacing their own property) do not count against the department.

Performance Measure B

For their final performance measure, the team had already set a goal that they would not spend more than 5% of their time resolving problems resulting from the monthly property list. For their performance measure they chose percent time spent resolving property list problems (time spent by the four property specialists). Again, as a ratio it would be written as:

$$\frac{\text{Total hours spent on resolutions}}{\text{Total hours worked per month}} \times 100$$

The raw data are already spelled out in the numerator and denominator of the performance measure. They consist of the total number of hours the four property specialists spend on problem resolution and the total number of hours they work each month. The sensor to record this did not exist, so the supervisor had the payroll department provide them with a special job number to add to their time card to track time spent resolving property list problems.

The team was pleased with their results (Figure B-5) and was ready to move to the next step.

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Step 4: Establish Performance Measurement(s) Summary

Critical Activity 1:

Performance Measure A: Number of days from call to pick-up
Raw Data: Date of call for pick-up services, actual pick-up date
Sensor: Property Transfer Form
Frequency: Weekly

Performance Measure B: % on-time special pick-ups
$$\frac{\text{Number on-time special pick-ups}}{\text{Number scheduled special pick-ups}} \times 100$$

Raw Data: Number of special pick-ups scheduled each week, number on time
Sensor: Property Transfer Form
Frequency: Compiled weekly

Performance Measure C: % on-time pick-ups (for all pick-ups)
$$\frac{\text{Number on-time pick-ups}}{\text{Total number of pick-ups}} \times 100$$

Raw Data: Total number of pick-ups completed, total number on time
Sensor: Property Transfer Form
Frequency: Compiled weekly

Critical Activity 2:

Performance Measure A: % accuracy of monthly report
$$\frac{\text{Number of error-free line items}}{\text{Total number of line items}} \times 100$$

Raw Data: Total number of line items entries generated each month on property list, number of errors detected (used to calculate number error-free)
Sensor: Property List Database, Complaint Log
Frequency: Compiled monthly

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Performance Measure B: % time spent resolving property list problems

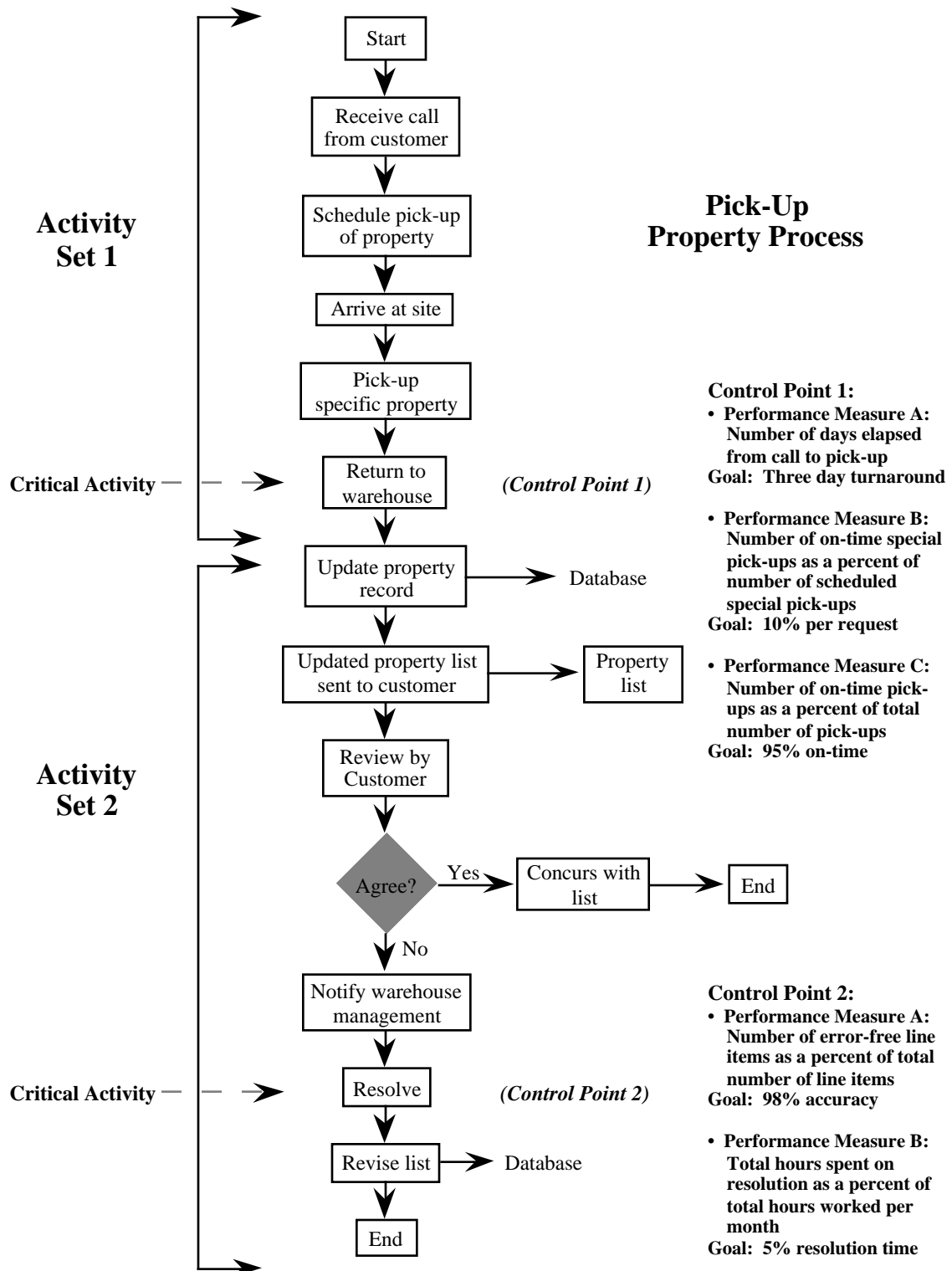
$$\frac{\text{Total hours spent on resolution}}{\text{Total hours worked per month}} \times 100$$

Raw Data: Total number of hours that the four property specialists spend on problem resolution each month, total hours worked by the property specialists each month

Sensor: Time card with special job number to track problem resolution time

Frequency: Compiled monthly

Figure B-5
Step 4 - Establish Performance Measurement(s)



Step 5: Identify Responsible Party(ies)

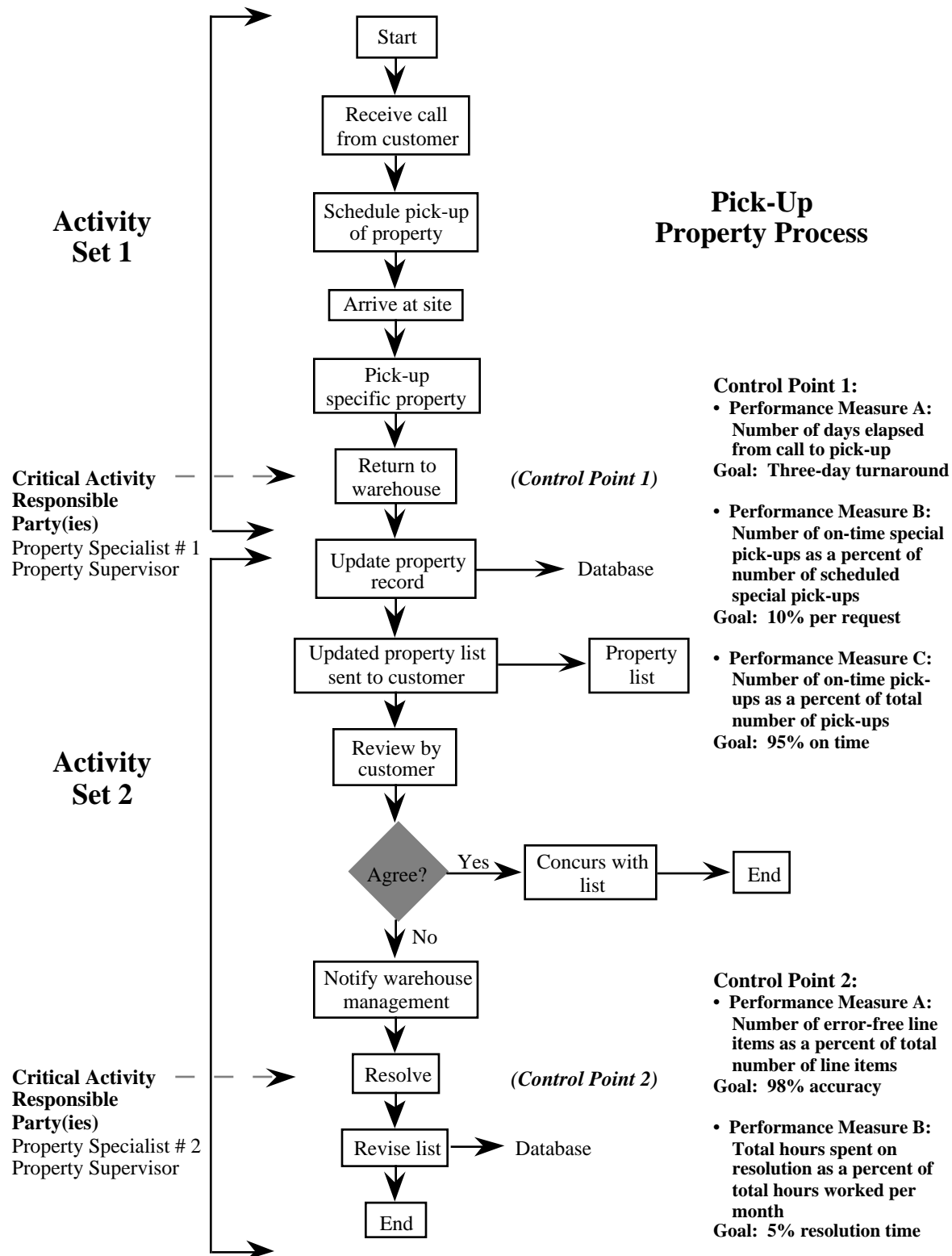
The team was glad they had completed identifying the performance measurements. The next step was a fairly easy one for the team members. They needed to identify responsible parties for collecting the data, analyzing/reporting actual performance, comparing actual performance to goal/standard, determining if corrective actions are necessary, and making changes.

For Critical Activity 1, a property specialist #1 will be responsible for collecting, interpreting, and providing feedback on the data. The warehouse supervisor will be responsible for making decisions and taking action. (Refer to Figure B-6.)

Obviously, many people could be involved in collecting data; however, someone needs to be responsible for compiling the data and comparing actual performance with the department goal. If a difference warrants, they need to notify the decision maker.

For Critical Activity 2, a similar argument was used. The group selected another property specialist #2. However, the same supervisor will be the responsible decision maker. (Refer to Figure B-6.)

Figure B-6
Step 5 - Identify Responsible Party(ies)



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Step 6: Collect Data

At this step, the supervisor reviewed her notes again. She remembered from her seminar that even the best of measurement systems have failed because of poor data collection.

As the system owner, she needed to be the one with the overall responsibility for supervising the data collection process. Each employee was of course responsible for the quality of his/her own work, but she needed to be sure the data were being collected properly and that people were doing their assignments.

Data collection was much more than simply writing things down and then analyzing everything after a period of time. She resolved to conduct several preliminary analyses to determine if the measurement system was functioning as designed, that the frequency of data collection was appropriate, and to provide feedback to the data collectors with respect to any adjustments in the system.

In process step 2, schedule pick-up of equipment, the team identified two control points. The first control point covers flow process activity numbers 2, 4, and 5. The second control point covers activity numbers 11 and 12. (See Figure B-7).

For the first control point, the use of an existing property transfer form, already in use for recording the data, was determined to be the most efficient means for collecting the necessary information:

Activity 2: Schedule pick up of equipment

The date the customer placed the request. The scheduled date for the pick-up.

Activities 4 and 5: Pick-up specific property and return to warehouse

The date the property was actually picked up and delivered to the warehouse.

Because of the variety of the raw data comprising the performance measures, the data gathering approach at the second control point was somewhat more complex. A complaint logbook is used to record a description of the problem, its resolution, and related dates. Time charging records of the problem solving personnel could also be reviewed. The required information was:

Activity 11: Notify warehouse management

A description of the problem and the date the division notified the warehouse (complaint logbook).

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Activity 12: Resolve

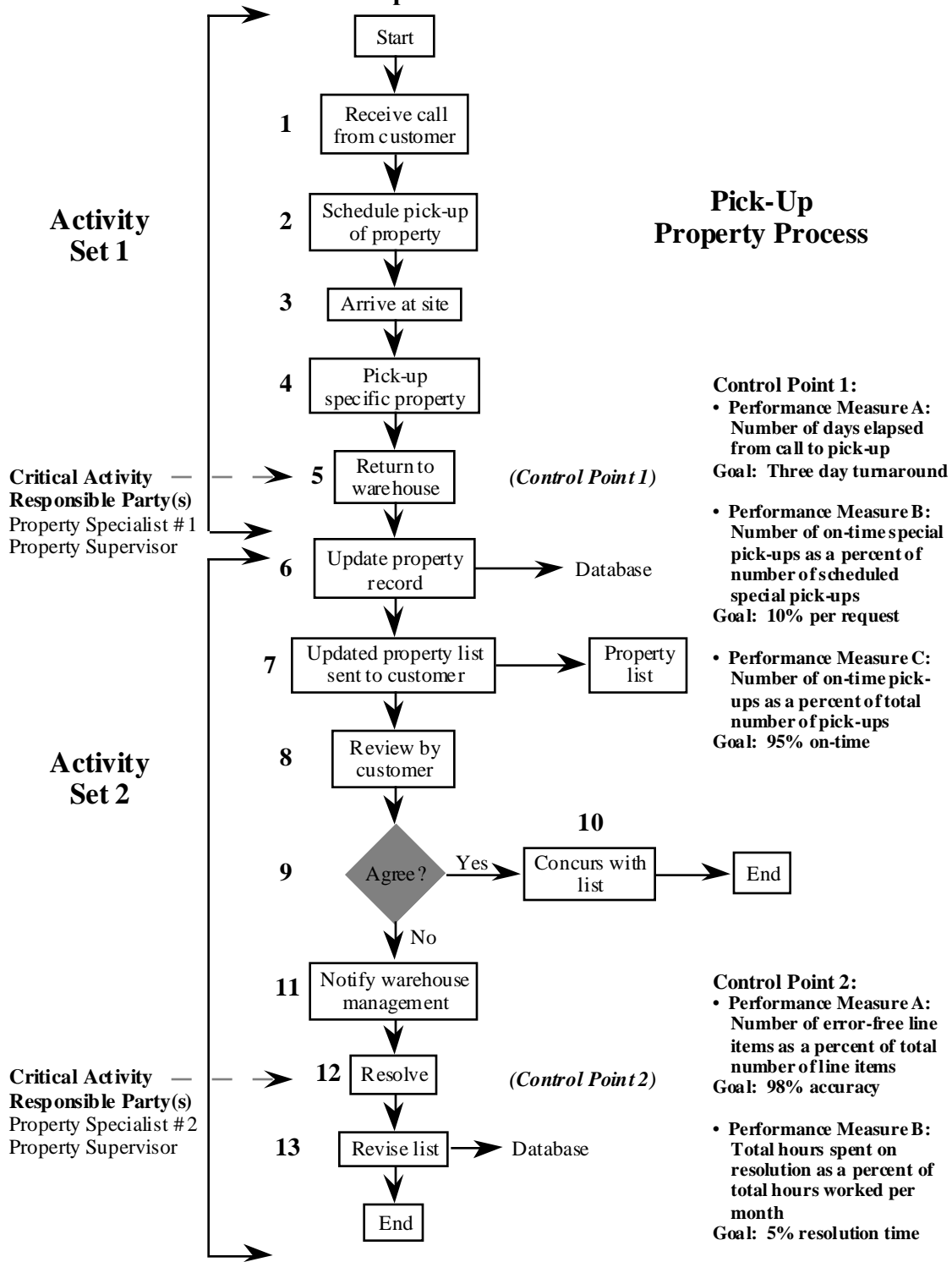
A description of what was done to resolve the issue and the date action was taken (complaint logbook).

The time spent by a property specialist in resolving the specific issue versus the total time spent on all work activities during the issue resolution period (time card records).

The total number of reports distributed during the measurement interval (property reports).

The team gathered data for a five-month period. During the first month, the supervisor had a preliminary look at the data they were collecting on a weekly basis. She continued her spot checks each month until the full collection period was completed. Ultimately, there were no significant changes to the measurement system or collection frequency. The supervisor felt the team had done an excellent job in understanding their process and designing their system. They were now ready to begin Step 7, which involved analyzing the data.

Figure B-7
Step 6 - Collect Data



Step 7: Analyze/Report Actual Performance

After five months, the supervisor felt they had a good baseline on which to start their analysis. Just what do these data mean? The team was reminded of the issue of customer complaints that started them thinking about performance measures. The supervisor asked them, “What were the questions, identified in Step 2, that we felt needed to be answered?” The team responded:

1. How do we know that we are providing the service that our customer requires?
2. Where can we do better or improve?

In this step, we will explore some of the possible ways to analyze and to display the results of these performance measures to clearly communicate the answer to their questions.

They started with Control Point 1. Performance Measure A was: number of days elapsed from call to pick-up. Their goal was pick-up within three days or less from date of call. They had collected the following data:

1. The time a call to pick-up was received
2. The day it was picked up

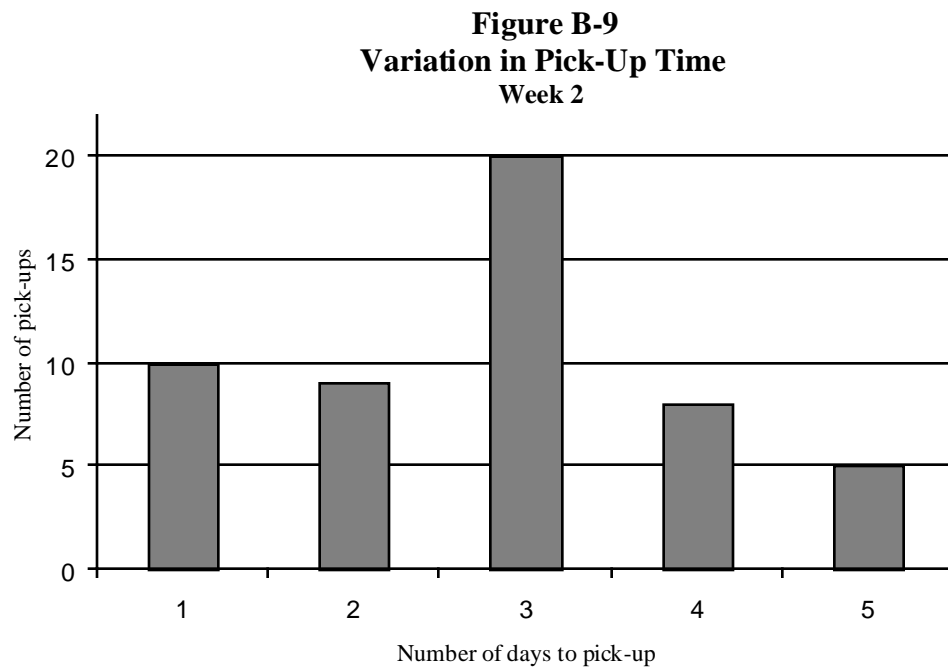
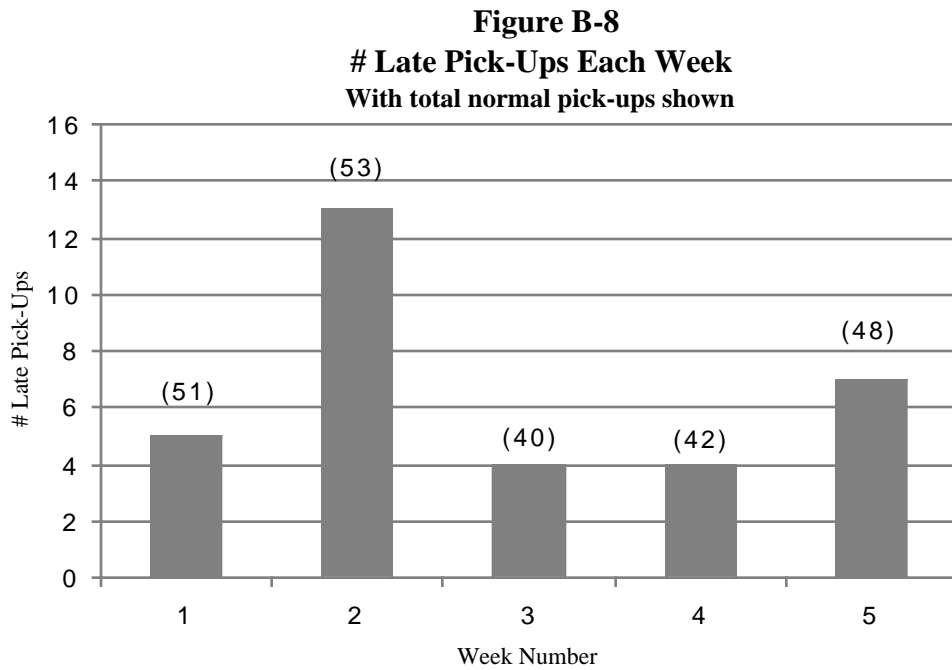
The forms the team used recorded a lot of information. They revealed how many pick-ups actually took longer than three days and were late, and how early or late each pick-up was. One way to look at the data is to use a bar chart to plot the number of late pick-ups each week (the number of on-time pick-ups could also be plotted). This will show the progress each week, and after several weeks or months, some trends may appear.

Figure B-8 shows a simple bar chart reflecting the number of late pick-ups each week. It shows that in week one, there were five late pick-ups out of 51, with 13 during week two, and so on. The next step would be to investigate what happened during week two and analyze the process to see what can be done to meet the goal.

The same set of data can be used to view the process from a different perspective. A frequency chart, as in Figure B-9, can be created to show the variation in the process. This shows the results of the second week in January (week two in Figure B-8); of the 13 late pick-ups, for eight of them it took four days and for five of them it took five days. The goal is three days or less, and it was seen that it usually takes three days. However, the data also showed that ten times it took one day and nine times it took two days. This type of chart shows how capable the process actually is.

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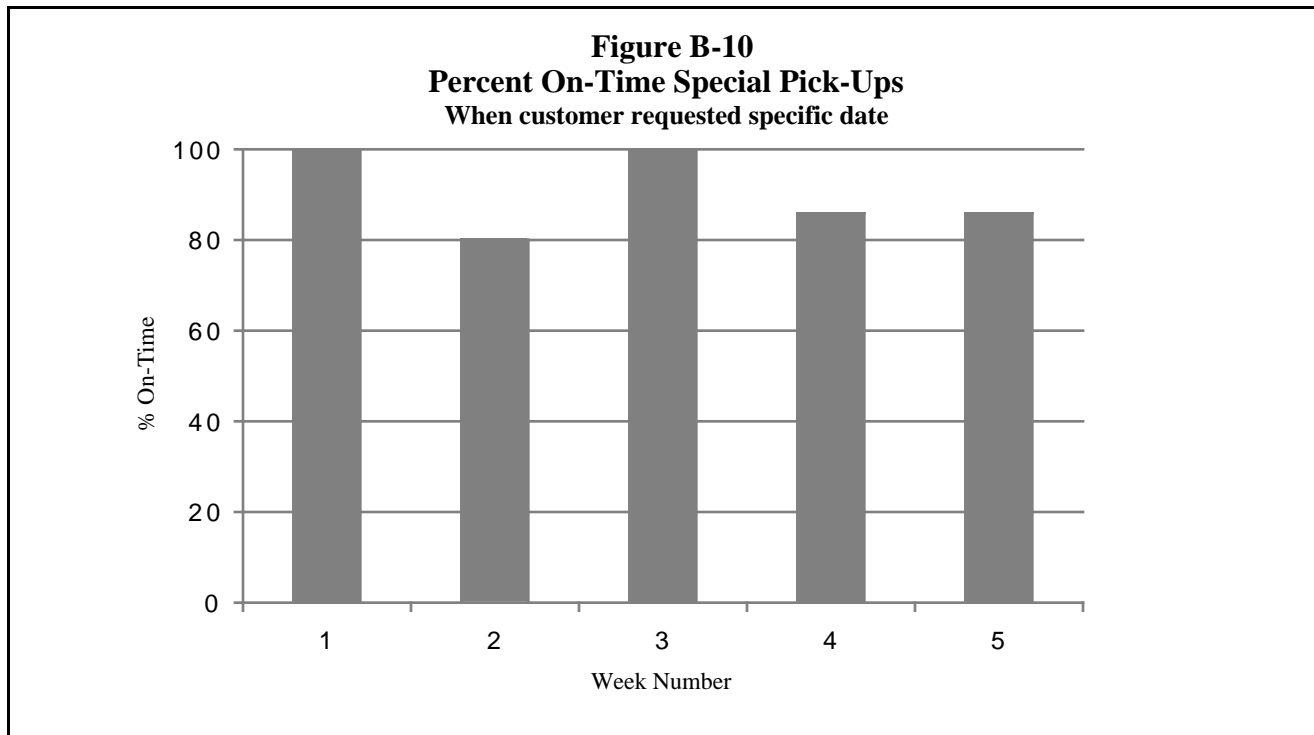
Step 7: Analyze/Report Actual Performance (continued)

The team continued with Critical Activity 1, Performance Measure B: Number of on-time special pick-ups. The goal was meeting the customer's specific need 100% of the time. We collected the following data:

1. The date the customer requested pick-up
2. The actual date picked-up

This measure looks at how well those customers who want pick-up service provided on a particular day are served. The data could be plotted as late pick-ups as in Figure B-8, or could be plotted as the number of on-time pick-ups each week. Since this performance measure results in a ratio, a bar chart can be used, as in Figure B-10, to measure the percent on-time pick-ups performed each week. The bar chart can show the progress week-by-week.

If it was found that the group was consistently missing their goal, this should be investigated to find out why and some type of process improvement should be performed. A frequency chart, such as Figure B-9, may be useful in the study of the process.



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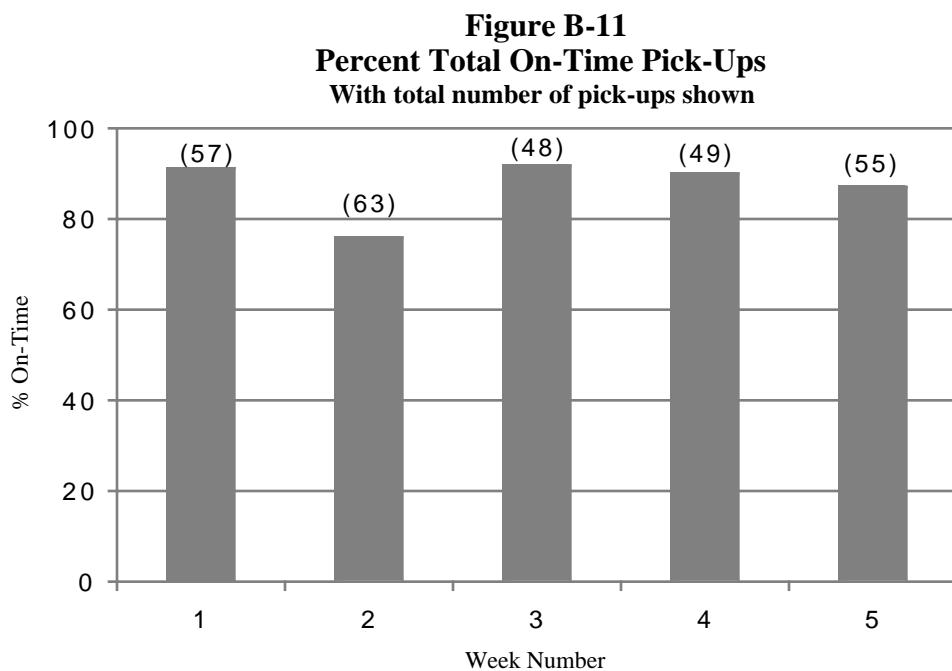
Step 7: Analyze/Report Actual Performance (continued)

The last performance measure for Critical Activity 1 is C: the number of on-time pick-ups with a goal to have at least 95% of the pick-ups on time.

The team collected the following data:

1. The total number of pick-ups in a week.
2. The number of pick-ups performed in three days or less when the customer specified no date.
3. The number of on-time pick-ups when the customer specified a special date.

This performance measure looks at how well the entire property pick-up process is working. It counts all on-time pick-ups against the total number of pick-ups each week. Like Performance Measure B, this measure also results in a ratio when the data are put in. Likewise, a simple bar chart, such as in Figure B-11, can be used to track these over a period of some five weeks. Progress can be seen at a glance.



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Step 7: Analyze/Report Actual Performance (continued)

The team now began to look at Critical Activity 2, Performance Measure A: the percent of error-free line items with a goal of 98% or more of all line item entries to be error-free.

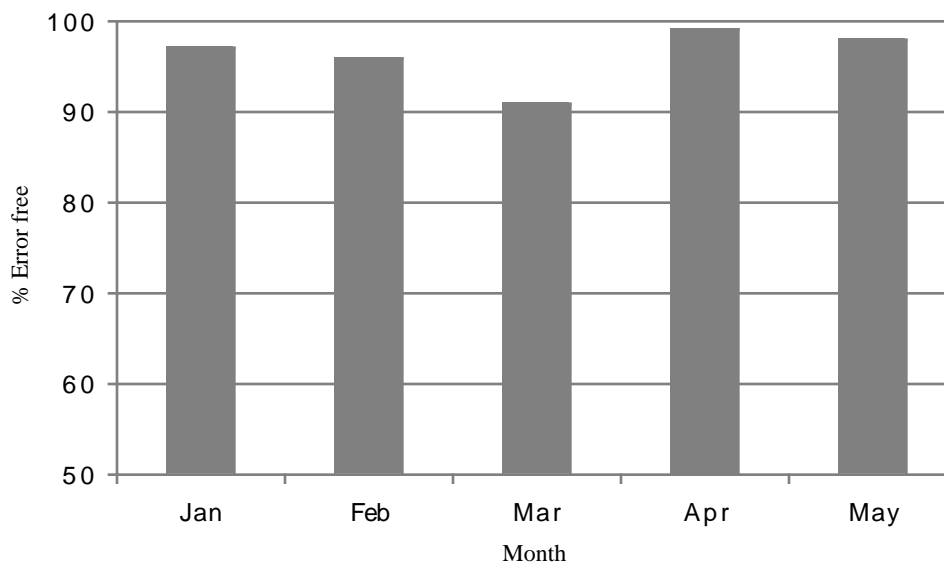
The team collected the following data:

1. The total number of line items processed each month.
2. The total number of line item errors processed each month.

This performance measure tells how well the information on the transfer forms is recorded and transferred to the data base (Activity 6.) It also measures customer satisfaction indirectly because every error made causes customers to investigate the source of any discrepancy. A simple way to display these data is again to use a simple bar chart, Figure B-12, that plots the resulting ratio month by month. It is easy to see if the 98% error-free goal is being met.

The transfer forms generate the data that are used and, therefore, provide additional information for inclusion on the actual volume of transfer forms processed each month as part of the graph. The number could be written in each column and would reveal if the error rate is a function of the volume of forms processed.

Figure B-12
Percent Error Free Line Items



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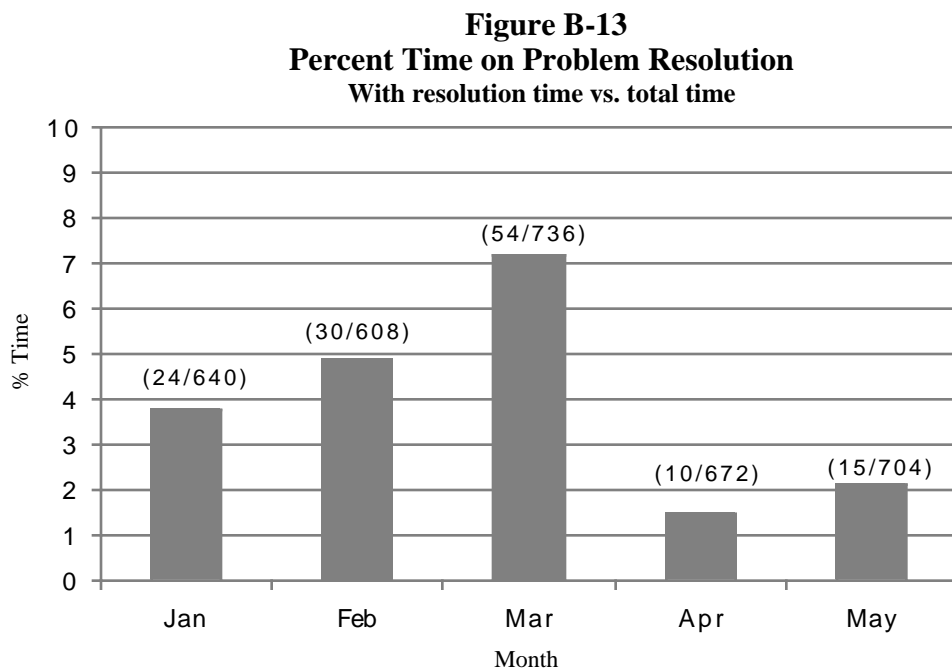
Step 7: Analyze/Report Actual Performance (continued)

Finally, the team had come to its last performance measure. Performance Measure B was the total hours spent on resolutions with a goal that 5% or less of the team's time be spent on property list discrepancies.

The team had collected the following data:

1. The total number of hours worked by the property specialist each month taken from the time cards.
2. The total number of hours the property specialists charge to problem resolutions each month.

Performance Measure B gauges the cost of the transfer form and reports errors in terms of time spent resolving problems. Like previous measures, this one also results in a fraction that can be plotted on a bar chart. Figure B-13 shows the results of five months of data collection. It shows if a goal is being met, the process being made, and if any trends are apparent.



Step 8: Compare Actual Performance to Goal/Standard

The supervisor was satisfied with the team's efforts and results. They had learned a lot about performance measures and now understood their importance and why they needed to measure. They realized that if you cannot measure your process, you cannot control it. If you cannot control it, you cannot manage it. Without dependable measurements, intelligent decisions cannot be made.

They were almost finished with the process. The team needed to compare their actual performance to their goals.

Once a comparison against their goals was completed, the team had several alternatives:

- Forget it. Variance is not significant - economically or statistically.
- Fix it.
- Challenge the goal (or standard).
- Review performance measures. Are they answering our questions?

The supervisor told her team that "if corrective actions are not necessary, the team would continue the data collection cycle."

Step 9: Corrective Action Necessary?

Is corrective action necessary? The supervisor instructed her team that if the answer to this question was yes, they would need to take the necessary action to bring their performance back into line with their goal(s)-the final step in closing the feedback loop.

She further stated that the key objectives of correction are:

1. Removal of defects, which are, in many cases, worker-controllable.
2. Removal of defect causes whether worker or management-controllable, dependent up on the defect cause.
3. Attainment of a new state of process that will prevent defects from happening.
4. Maintenance or enhancement of the efficiency and effectiveness of the process, an essential condition for continuing process optimization and ultimately increasing the competitiveness and profitability of the business itself. The removal of defects and defect causes at the expense of productivity or efficiency is inherently self-defeating.

APPENDIX B

PERFORMANCE MEASUREMENT PROCESS CASE STUDY

After reviewing the Performance Measure Report, the team did not feel that Performance Measurement A was answering their questions. Performance Measurement C more clearly achieved their objective; therefore, they decided to delete Performance Measurement A from further data collecting and consideration.

The team also decided to tackle the problem of late pick-ups. They had a goal of 95% on-time pick-ups. They never met their goal. Why? After further discussions, the supervisor and team members felt they would form a quality improvement team to look at this problem and identify the solution(s). They can use a lot of the data they have already collected to assist them in finding the root cause of the problem.

Additionally, they would continue to gather data for another five to six months, review it, and determine if any further action would be necessary.

Conclusion

The Quality Improvement Team has been established and currently is working the problem trying to determine the root cause. Therefore, the team would come back to address steps 10 and 11 after they complete their investigation.

The team members told their supervisor they finally realized the value and importance of doing performance measures on their processes.

The supervisor asked her team to summarize for her why they should measure. The team wrote down the following:

Performance measures can be used for:

1. **Control:** to help reduce variation.
2. **Self-Assessment:** to assess how well our process is doing, including any improvements we may have made.
3. **Continuous Improvement:** to identify defect sources, process trends, defect prevention, and to determine process efficiency and effectiveness, and opportunities for improvement.

The supervisor was very pleased.

APPENDIX B

PERFORMANCE MEASUREMENT PROCESS CASE STUDY